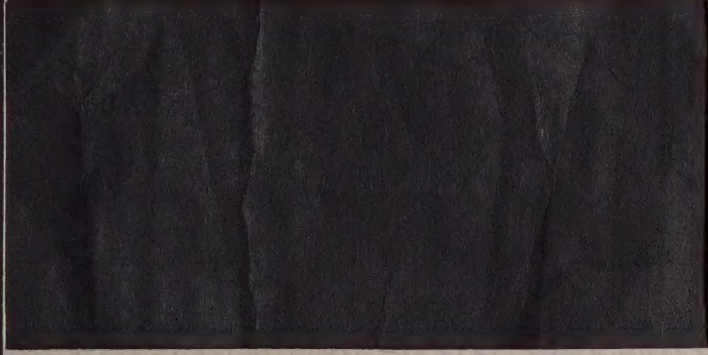


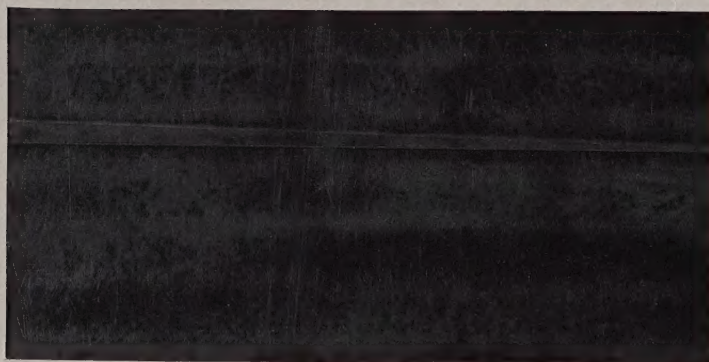


DIGI-DATA CORPORATION

8580 Dorsey Run Rd., Jessup, Md. 20794



DIG



OPERATION MANUAL
TRANSPORT MAINTENANCE CARD
MODEL TC-15

RECORD OF REVISIONS

REVISION LETTER	DESCRIPTION	DATE
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SECTION 1

GENERAL DESCRIPTION

The TC-15 maintenance card provides the sequential commands and simulated data patterns required to adequately and conveniently test any Digi-Data synchronous magnetic tape transport. This 2 inch by 8 inch test card, containing ten switches and four potentiometers, plugs directly into the transport I/O connector J101, and may be employed with an internally-terminated tape unit, as well as, with a standard tape unit not having line terminators.

The TC-15 provides forward and reverse commands in three modes to cause either continuous tape motion, repetitive start/stop motion, or alternating forward and reverse motion. The TC-15 also generates signals to write NRZI or phase encoded data at an adjustable density in a choice of three patterns. Upon sensing end-of-tape the test card issues a selected command to the transport to prevent tape from running entirely off the supply reel.

The standard version of the TC-15 is version 0003. Version 0002 (sold only in certain OEM situations) has an additional feature which provides skew test points for 7 and 9 track transports.

Page 1

Section 1

The first section of the document discusses the importance of maintaining accurate records. It states that records are essential for the proper functioning of the organization and for the protection of its assets. The section also discusses the various methods used to collect and analyze data, and the importance of ensuring the accuracy and reliability of the information.

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SECTION 2

CONTROLS

2.1 MOTION CONTROLS

2.1.1 MOTION CONTROL SWITCHES

Stop/Run Switch. This two-position slide switch, designated SW-6, asserts the transport SELECT line in the RUN position. When SELECT goes false all tape motion except rewinding is immediately terminated.

DC/Pulse Switch. This two-position slide switch, designated SW-4, causes continuous tape motion in the DC position, or start/stop tape motion in the PUL position.

Forward/Shuttle/Reverse Switch. This three-position slide switch, designated SW-1, creates a forward motion command (SFC) in the FWD position, a reverse motion command (SRC) in the REV position, and alternating SFC and SRC commands in the SH position. Shuttling motion will not occur unless the DC/Pulse Switch is in the PUL position.

Rewind Command Switch. This pushbutton switch, designated SW-7, is labelled RWC. When depressed a rewind command is issued to the transport.

EOT Action Switch. This two-position slide switch, designated SW-9, determines the action to be taken when the end-of-tape marker is sensed (EOT). In the RWC position a rewind command is issued; in the OFFC position an off-line command issued, thereby halting the tape at EOT. (NOTE: Tape must be off EOT to go back ON LINE.)

2.1.2 MOTION CONTROL ADJUSTMENTS

With the DC/Pulse Switch in the PUL position the following two adjustments are active.

Go Time. Turning this one-turn potentiometer, R8, clockwise increases

the true duration of the motion command (SFC or SRC).

Stop Time. Turning this one-turn potentiometer, R7, clockwise increases the false duration of the motion command (SFC or SRC).

2.2 DATA CONTROLS

2.2.1 DATA CONTROL SWITCHES

Read/Write Switch. This two-position slide switch, designated SW-5, asserts the Set Write Status line (SWS) to the transport when in the WRT position. The READ position holds SWS false.

Density Switch. This two-position slide switch, designated SW-8, asserts the Data Density Select line (DDS) to the transport in the TRUE position, thereby selecting the higher density of a 7 track NRZI unit or the NRZI circuitry of a 9 track NRZI/PE unit.

One's/Pattern Switch. This two-position slide switch, designated SW-3, selects an all "one's" write data pattern in the 1's position, and an alternating "one" and "zero" data pattern in the PAT position. When operating a phase encoded transport this switch must be in the PAT position.

Same/Alternate Switch. This two-position slide switch, designated SW-2, is operative only when the One's/Pattern Switch is in the PAT position. In the SM position all write data lines will change from true to false simultaneously; in the ALT position odd-numbered tracks will change to "one" when even-numbered tracks change to "zero", and vice-versa. Since an all "zero's" character cannot be recovered by the NRZI read circuitry this switch should be kept in the ALT position when writing the pattern on a NRZI transport.

Frequency Range Switch. This three-position slide switch, designated SW-10, selects one of three available frequency ranges (LO, MED, HI) for the generation of Write Data Strokes (WDS) to the transport.

2.2.2 DATA CONTROL ADJUSTMENTS

Coarse Frequency Adjust (R5) and Fine Frequency Adjust (R6). These two potentiometers may be adjusted in conjunction with the Frequency

Range Switch to generate WDS's at all frequencies required by Digi-Data transports. Required character rate may be determined by multiplying tape speed times data density. NRZI transports require one WDS per character, phase encoded transports require two WDS's per character. For example, a 1739-6-4-2RW transport requires WDS's at 144 KHz ($1600 \text{ BPI} \times 45 \text{ IPS} \times 2$).

SECTION 3

TEST POINTS

3.1 LABELLED TEST STAKES

Eight labelled test stakes are provided on the TC-15 maintenance card. They are, (*Version - 0002 only).

VCC	+5V from the transport
GND	Logic Ground
RDS	Read Data Strobe
WDS	Write Data Strobe
F	Synchronous Forward Command (SFC)
R	Synchronous Reverse Command (SRC)
Skew 7*	Skew Test Point, 7 Track Transport
Skew 9*	Skew Test Point, 9 Track Transport

3.2 LOCATION OF TRANSPORT I/O SIGNALS

The transport I/O signals may be observed at the following pins on the TC-15. Refer to the transport manual for signal definitions and anticipated levels.

<u>J101 Pin</u>	<u>TC-15 Location</u>	<u>Mnemonic</u>	<u>Signal</u>
2,4	TP "VCC"	+5V	Transport, +5 Volts
6	TP "R"	SRC	Synchronous Reverse Command
8	TP "F"	SFC	Synchronous Forward Command
10-16	U2-1	SLT0,1,2,3	Decoded Unit Select
18	U2-2	OVW	Overwrite
20	U2-3	RTH1	Read Threshold 1
22	U2-4	RTH2	Read Threshold 2
24	TP "WDS"	WDS	Write Data Strobe
26	U2-5	WARS	Write Amplifier Reset
28	U2-6	SWS	Set Write Status
30	U2-1	SLT	Select
32	U3-1	NRZ	NRZI Unit
34	SW-9	EOT	End-of-tape
36	U3-2	LDP	Load Point
38	U3-3	FPT	File Protected

<u>J101 Pin</u>	<u>TC-15 Location</u>	<u>Mnemonic</u>	<u>Signal</u>
40	U3-4	RWD	Rewinding
42	U3-11, U8-2	ONL	On Line
44	U3-5	RDY	Ready
46	U3-6	SPD	Low Speed Unit
48	U3-10	SGL	Single Gap Unit
50	U3-9	7 TRK	Seven Track Unit
52	U3-8,	DDI	Data Density Indicator
54	U4-1	RDP	Read Data, Parity
56	-	-	Not Used
58	-	-	Not Used
60	U4-13	RDO	Read Data, 0
62	U4-2	RD1	Read Data, 1
64	U4-12	RD2	Read Data, 2
66	U4-3	RD3	Read Data, 3
68	U4-11	RD4	Read Data, 4
70	U4-4	RD5	Read Data, 5
72	U4-5	RD6	Read Data, 6
74	U4-6	RD7	Read Data, 7
76	TP "RDS"	RDS	Read Data Strobe
78	U2-8	DDS	Data Density Select
80	U5-12	WDP	Write Data, Parity
82	U10-2	WDO	Write Data, 0
84	U5-2	WD1	Write Data, 1
86	U10-4	WD2	Write Data, 2
88	U5-4	WD3	Write Data, 3
90	U10-10	WD4	Write Data, 4
92	U5-6	WD5	Write Data, 5
94	U10-6	WD6	Write Data, 6
96	U5-8	WD7	Write Data, 7
98	U2-9	OFFC	Off Line Command
100	U2-10	RWC	Rewind Command

SECTION 4

OPERATING INSTRUCTIONS

4.1 TRANSPORT CAPSTAN SERVO ADJUSTMENTS

These instructions should be used in conjunction with the applicable transport manual. Switch settings not indicated in a particular set-up described below are not pertinent to that set-up.

4.1.1 CAPSTAN MOTOR SPEED

Appropriate setting of TC-15 switches to perform capstan motor speed adjustments as directed in the transport manual are,

for forward speed,

SW-1:	FWD
SW-4:	DC
SW-6:	RUN
SW-9	RWC (EOT)

for reverse speed,

SW-1:	REV
SW-4:	DC
SW-6:	RUN

for rewind speed,

depress and release the pushbutton

SW-7:	RWC
SW-6:	RUN

4.1.2 START/STOP RAMPS

To adjust the transport acceleration and deceleration time, per the transport manual, set the TC-15 switches to,

SW-1:	SH
SW-4:	PUL
SW-6:	RUN

and adjust the GO and STOP potentiometers to the following recommended

approximate times in order to achieve an adequate oscilloscope presentation.

<u>Tape Speed</u>	<u>Go, Stop Time</u>
12.5 IPS	40-50 milliseconds
18.75 IPS	25 milliseconds
25 IPS	20 milliseconds
37.5 IPS	15 milliseconds
45 IPS	15 milliseconds

4.2 TRANSPORT REEL SERVO ADJUSTMENTS

To adjust the center position and the operating arc of the transport tension arms, per the directions in the applicable transport manual, set the TC-15 switches and times as indicated below.

SW-1: SH
SW-4: PUL
SW-6: RUN
R-7: STOP time 50 msec
R-8: GO time 1-2 sec

4.3 TRANSPORT WRITE AND READ TESTS

4.3.1 DATA SELECTIONS

a) To write an all "ones" NRZI tape set the TC-15 switches,

SW-1: FWD
SW-2: ALT
SW-3: 1's
SW-4: DC
SW-5: WRT

SW-6: RUN
SW-8: Density TRUE (9 track)
SW-9: OFFC (EOT)

b) To write an alternating pattern on NRZI tape use the switch settings above changing SW-3 from 1's to PAT.

c) To write a phase encoded tape set the TC-15 switches,

SW-1: FWD
SW-2: ALT or SM
SW-3: PAT
SW-4: DC
SW-5: WRT
SW-6: RUN
SW-8: Density FALSE
SW-9: OFFC (EOT)

d) To read any tape set the switches,

SW-1: FWD or REV
SW-4: DC
SW-5: READ
SW-6: RUN
SW-8: Density as required

4.3.2 WRITE DATA STROBE FREQUENCY

Utilize the Frequency Range Switch, Coarse Frequency Adjust, and Fine Frequency Adjust to generate WDS's at required frequency dictated by tape speed, data density, and recording mode.

TAPE SPEED	DATA DENSITY			
	<u>200 BPI</u>	<u>556 BPI</u>	<u>800 BPI</u>	<u>1600 BPI</u>
12.5 IPS	2500 Hz	6,950 Hz	10 KHz	40 KHz
18.75 IPS	3750 Hz	10,425 Hz	15 KHz	60 KHz
25 IPS	5000 Hz	13,900 Hz	20 KHz	80 KHz
37.5 IPS	7500 Hz	20,850 Hz	30 KHz	120 KHz
45 IPS	9000 Hz	25,020 Hz	36 KHz	144 KHz

4.4 TRANSPORT READ SKEW MEASUREMENT

Skew test stakes SKEW 7 and SKEW 9 are provided only on version -0002 of the TC-15. To measure skew, read a "master alignment tape" with no write enable ring and observe the duration of the low state of SKEW 7 or SKEW 9 as appropriate. See the transport maintenance manual for acceptable limits.

In the NRZI mode, only "arrival skew" may be seen since all the READ DATA lines are cleared simultaneously. In the phase-encoded mode both "arrival skew" and "departure skew" will be observed. If it is desired to separate the two, trigger the scope negative on U9-11. The first low pulse on SKEW 9 will then be "arrival skew", and the second will be "departure skew", etc. A delayed trigger may be used on a dual time base scope to trigger the second time base on one or the other of these pulses.

On dual gap transports SKEW 7 and SKEW 9 may also be used to measure total write-to-read skew while writing an "all ones" tape. See paragraph 4.3.1 for switch settings.

SECTION 5

SUPPORT DOCUMENTATION

5.1 CIRCUIT DESIGN

The following circuit descriptions refer to schematic drawing no. 0251157-0000.

5.1.1 MOTION CONTROL CIRCUITS

GO and STOP times are established in the circuit centered upon U11. The duration of GO is based on the charging of C6 through CR1, R4, and R8; the duration of STOP (i.e. $\overline{GO}$) is based on the discharging of C6 through R3 and R7.

The DC/Pulse Switch holds GO true in the DC position.

The output of U7, pins 5 and 6, determine the direction of tape motion. As a function of the FWD/SH/REV switch position this flip-flop is held set, is allowed to toggle in response to the GO signal, or is held clear. GO is AND'd with the outputs of U7 to form SFC and SRC (U1-8,11).

5.1.2 DATA CONTROL CIRCUITS

The Write Data Strobe is generated by the U6 one-shots. The true duration of WDS at pin 5 is fixed at 2 microseconds by R1 and C2. The false duration of WDS at pin 13 is variable with the adjustment of R5 (coarse) and R6 (fine), and the parallelling of C4 with C5 and C6 through the Frequency Range Switch, SW-10.

The write data pattern is established in U10 (even-numbered tracks) and U5 (odd-numbered tracks) as a function of,

- 1) the state of flip-flop U7 which is toggled by every $\overline{WDS}$,
- 2) the position of the Same/Alternate Switch, SW-2, and
- 3) the position of the One's/Pattern Switch, SW-3.

With SW-3 in the 1's position all write data lines are forced true.

With SW-3 in the PAT position the changing output of U7 appears on the write data lines. With SW-2 in the SM position all lines follow the Q output (pin 9); in the ALT position even-numbered data lines follow the $\bar{Q}$ output (pin 8).

5.1.3 SKEW MEASUREMENT CIRCUIT

The skew measurement signals are generated by a 512 x 4 bipolar read only memory, U9. The 9 address lines of the ROM are the transport's read data lines. The skew test points are the data outputs of the ROM.

The SKEW 7 and SKEW 9 outputs are programmed to generate "1" outputs when the read data lines are all in the same state (address lines are all "0"'s or all "1"'s), and "0" outputs otherwise. Thus, under the assumption that all of the read channels are processing identical data, the low duration of the test points represents skew.

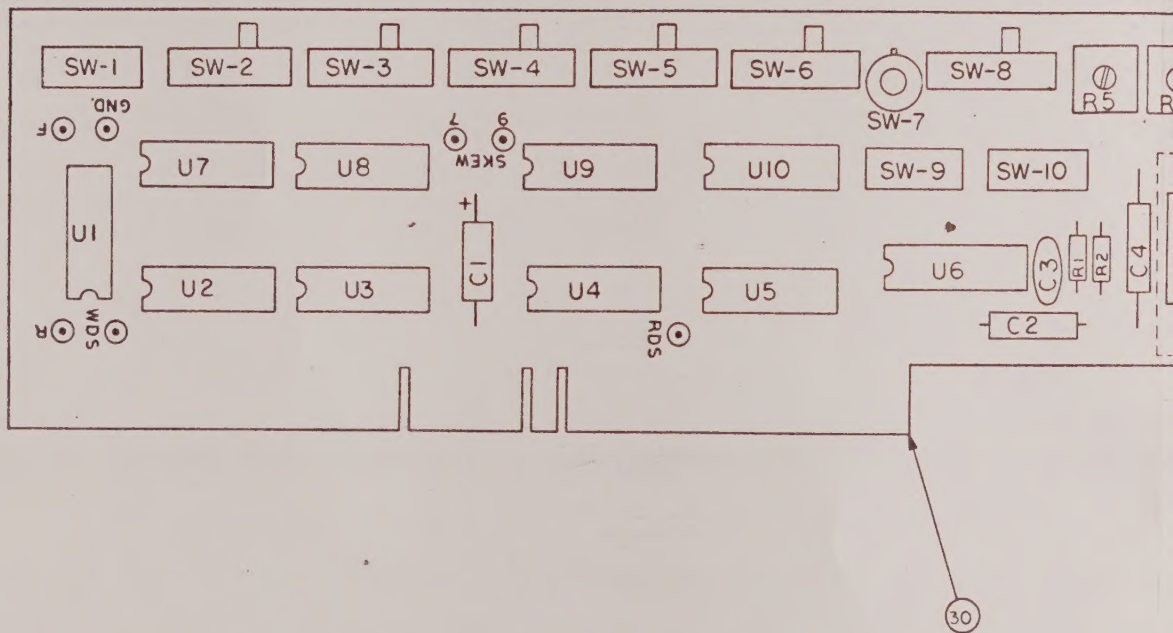
In PE units, the skew associated with "0" to "1" data transitions may be different from the skew associated with "1" to "0" transitions. (There will always be a difference in NRZI units, since logical "1"'s arrive asynchronously at the data latches, which are later cleared simultaneously). Outputs U9-10 and U9-11 have been programed as scope trigger signals, to separate the two types of skew pulses. These outputs are for 7 and 9 track units respectively, and are "1" only when the read data lines are all logical "0", i.e. high voltage state. The negative transitions of these outputs mark the arrival of logical "1" data.

Addendum to TC-15 Parts List 0051158-0000

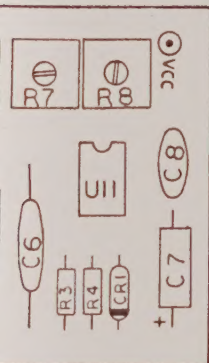
TC-15 Assembly with skew test points -0002

TC-15 Assembly without skew test points -0003

A8	A7	A6	A5	A4	A3	A2	A1	A0	D4	D3	D2	D1
0	0	0	0	0	0	0	0	0	1	0	0	1
0	0	0	1	0	0	0	0	0	1	0	0	0
0	1	0	0	0	0	0	0	0	1	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0
1	0	1	0	1	1	1	1	1	1	1	0	0
1	0	1	1	1	1	1	1	1	1	1	0	0
1	1	1	0	1	1	1	1	1	1	1	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1
ALL OTHER ADDRESSES									0	0	0	0



REV	ECN NO	DATE	APP
A	ORIG. ISSUE	7-28-77	J.T.
B	CL A REL-ECN-123	11-2-77	RE



SEE NOTE 1

NOTES

1. ASSEMBLY NUMBER AND APPROPRIATE VERSION WITH CURRENT REV LEVEL TO BE STAMPED IN APPROPRIATE AREA INDICATED IN BLACK ON FAR SIDE OF BOARD.

MATERIAL		SIGNATURE		DATE		DIGI-DATA CORPORATION	
FINISH		DR. J. J. JONES		7-28-77		8580 DORSEY RUN ROAD	
TOLERANCE-UNLESS		CHK. W. E. JONES		11-15-77		JESSUP, MD. 20794	
OTHERWISE SPECIFIED		ENG. J. J. JONES		7-28-77		SCALE: 2 : 1	SHEET 1 OF 1
3 PLACE $\pm .005$		CUST.					
2 PLACE $\pm .010$							
1750						TC-15 ASSEMBLY	
1630							
1130							
DO NOT SCALE THIS							
PRINT							
NEXT ASS'Y	USED ON					size	dwg no
						D	0051158-0000
						REV	R

